Modulating Vertical Boilers & Water Heaters

MVB®

Modulating Vertical Boiler

Models 504 thru 2004
Category I with vertical vent

Models 503 thru 2003
Category IV Venting

Up to ***88.4%*** *thermal efficiency!*

CSA Certified Lead Content
Less Than .25 Pb

Raypak®
A Rheem® Company

The Hot Water Management Experts

Category I*-up to 85% efficiency
Category IV-up to 88.4% efficiency

Raypak's Next Generation Modulating Boiler

Time-honored technologies unite with cutting-edge advancements in Raypak's MVB® modulating vertical boiler. Never before has a vertical boiler provided both the installer and building owner such installation flexibility, ease-of-commissioning, reliability and long-term performance. Small space, not a problem. The MVB has the smallest installed footprint of any vertical boiler, only 5.4 square feet. Raypak's MVB is built with commercial-grade components and materials. From our steel channel base to our stainless steel flue wrapper, you can tell the MVB is built to last. It's easy to handle and install, but still user friendly to service. Our compact design fits through a 30" door opening making it the perfect choice for those hard to reach retrofit projects. Now is the perfect time to take a closer look at Raypak.

Flexibility

Small diameter vents and industry-leading vent length allowances afford greater vent location options, thus reducing wasted space. Vent versatility is further enhanced by the self-tuning combustion system which compensates for unusual chimney and vent configurations.

Category I* -CSA-certified 84% boiler and up to 85% water heater models available. Our category I solution is the perfect replacement for your retro-fit applications. This reduces the installed cost by using existing category I venting or chimney. Installation couldn't be easier; all connections are on the back of the unit. Start-up is a snap, it's as close to plug-n-play as a boiler can get.

Category IV -CSA-certified 87% efficiency at full fire–the highest possible for non-condensing boilers *(Up to 88.4% at part load!)* When the job requires high efficiency, our category IV solution meets your needs.

At the heart of every Raypak MVB is a unique integral evaporator system - the first defense against harmful condensation. Raypak's evaporator system collects and re-evaporates condensate which may form during initial start-up or brief periods of cold-water operation, eliminating the need for a boiler condensate drain. This saves you money on installation costs as well as the headache of dealing with multiple condensate drains.

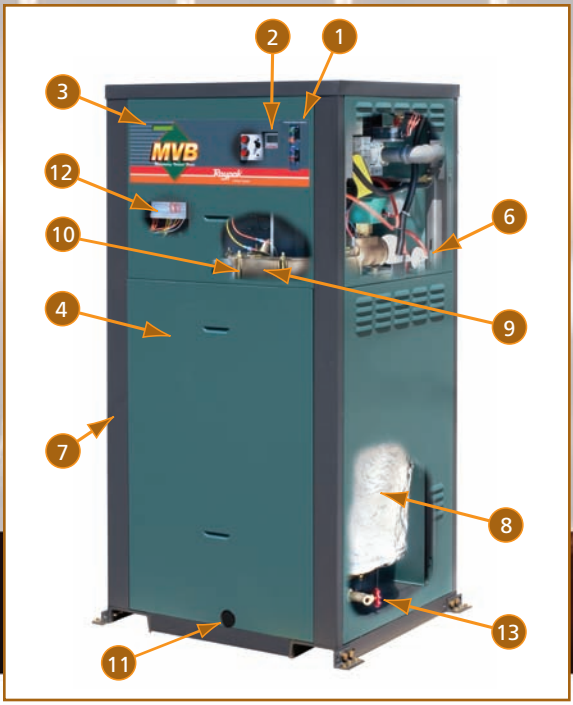
True Modulation

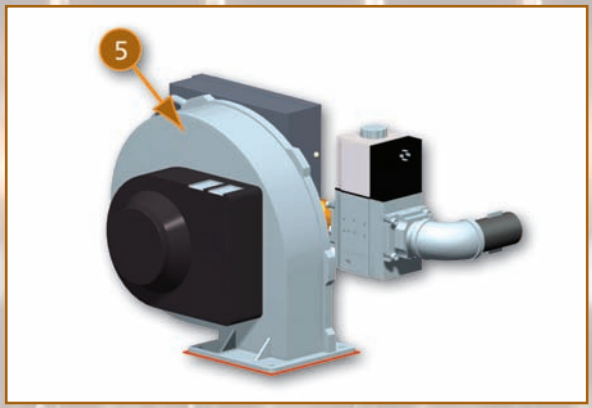
Modulation is nothing new to Raypak, we have honed our gas modulation experience for over 50 years. The Raypak MVB will infinitely track the heating load precisely with it's built in TempTracker Mod control, eliminating costly overshooting. Utilizing the latest European technology for the blower-gas valve package, the optimum fuel-air ratio is maintained throughout the entire range of the load-tracking operation. Our smooth 4:1 turndown (503 thru 2003) ensures efficiency is maintained through out the firing rate and actually increases during part load, right when you want it! The MVB automatically self-tunes to accommodate the widest range of gas supply pressures. The high quality integrated blower-gas valve is self-correcting and allows smooth operation with fluctuating gas supply pressures. The Raypak MVB is cutting edge technology with atmospheric simplicity.

Key Features

- 12 models from 500,000 to 2,000,000 BTUH
- Up to 85% efficiency (Cat. I*);
- Up to 88.4% efficiency (Cat. IV)
- No boiler condensate drain required (proprietary design)
- Lowest minimum required inlet water temperature (120F)
- Modulating gas valve and burner, up to 4:1 (503 thru 2003) turndown
- Engineered with precisely matched system components
- Smallest installed footprint (5.4 square feet) design fits tight spaces and easily replaces larger boilers
- Advanced diagnostics center, real English fault codes
- All models indoor/outdoor certified
- Complete cabinet protects all controls and wiring
- Meets all current Low NOx regulations
- Suitable for altitudes up to 10,000 ft. (derate above 5,000 ft.)
- With all copper and optional bronze waterways, the MVB is available in boiler and water heater configurations
- Inline combustion air filter (MERV8)
- All water heaters are low lead (<.25%) controlled.

*Category I with vertical vent, category III with horizontal venting and no extractor.





State of the art European combustion technology

1. Control Panel
Fully enclosed controls and wiring protect against damage or vandalism. Cabinet design affords easy access to controls for installation and service.

2. Temp-Tracker Mod Control
This factory-mounted multi-function control delivers precise load-tracking with selectable mode displays that are easy to access and read.

3. On Board Diagnostic Center
Factory-mounted standard equipment. Gives relevant service feedback as well as possible solutions to clear the fault. All in plain English, no cryptic codes to decipher. The control also stores up to 16 fault codes in its history file for the service technician to review.

4. Weather-Proof Jacket
Heavy gauge galvanized steel with a UV-resistant Polytuf powder coat finish is impervious to weather and corrosion.

5. Combustion Air Fan
Cast aluminum, non-sparking construction.

6. Vent Pressure Switch
Monitors vent pressure and provides safe shut down if back pressure is excessive.

7. Minimum Clearance Requirements
Only one inch of side clearance is required from combustible surfaces.

8. Vertical Heat Exchanger
Cylindrical, multi-pass heat exchanger captures all radiant energy, eliminating the need for heavy refractory.

9. Rugged Cast Headers
Bronze headers standard on water heater models. Cast-iron standard on boiler models, with bronze headers optional.

10. Tube Sheet Construction
Eliminates the repair & maintenance problems associated with rolled-tube construction. Easy, cost-effective component replacement.

11. Viewing Port
Allows easy burner inspection.

12. Low Voltage Wiring Connections
Up front and easy to get to. Makes sensor wiring and external control wiring simple and clean.

13. Drain Valves
Two drain valves located at the bottom of the heat exchanger. This allows for complete winterizing and drainage of the heater.

Optional Equipment

Cold Water Solutions

Cold Water Start – For applications that require reliable protection against harmful condensation caused by frequent, extended, cold water start-ups. Raypak's Cold Water Start protection system utilizes a proportional three-way valve to bypass water from the boiler outlet to the inlet during start-up, when the system return water temperature is below the minimum acceptable level. (See Cat. #1000.19)

Cold Water Run – For applications requiring constant condensation protection. Raypak's Cold Water Run system utilizes a variable-speed pump to inject just the right amount of water from the main system loop into the boiler to maintain the optimum inlet temperature. This approach allows the full capacity of the boiler to be utilized to meet the system load, while at the same time continuously maintaining the optimum inlet water temperature to prevent condensation. (See Cat. #1000.19)

Multi Boiler Solutions

Hybrid Control

BACnet BMS Link

TempTracker Mod+ Hybrid– Controls up to 16 Raypak boilers with PID logic. Automatic or manually selectable lead-lag boiler operation. TempTracker Mod+ Hybrid monitors and displays supply water temperatures on all applications including outdoor temperature when outdoor reset mode is selected. Can also be used to control a mix of condensing and non condensing boilers using our Hybrid control algorithm. Now available with optional BACnet® BMS link.
(See Cat. # 5100.22)

MVB
Modulating Vertical Boiler

Smallest Installed Footprint

The MVB's compact design allows for easy installation in the most challenging equipment rooms. It's easy to handle and install, but still user friendly to service. The MVB has the smallest installed footprint of any vertical boiler, only 5.4 square feet. The MVB contains all of it's components to the inside of the cabinet, so there won't be any fans or valves hanging off the cabinet that need extra clearance. The compact design fits through a 30" door opening making it the perfect choice for those hard to reach retrofit projects.

MBTUH

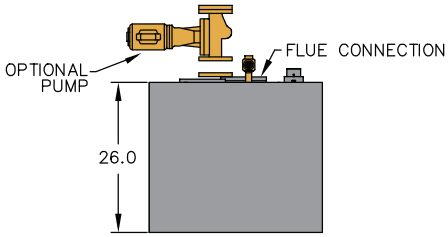
Model	Venting Category †	Boilers			Water Heaters			Input Min.
		Input	Output	Efficiency	Input	Output	Efficiency	
503	IV	500	435	87%	500	435	87%	125
753	IV	750	653	87%	750	653	87%	188
1003	IV	999	869	87%	999	869	87%	250
1253	IV	1250	1088	87%	1250	1088	87%	312
1503	IV	1500	1305	87%	1500	1305	87%	375
1753	IV	1750	1523	87%	1750	1523	87%	438
2003	IV	1999	1739	87%	1999	1739	87%	500
504	I*	500	420	84%	500	420	84%	357[a]
754	I*	750	630	84%	750	630	84%	536[a]
1104	I*	1100	924	84%	1045	888	85%	786[a]
1504	I*	1500	1260	84%	1425	1211	85%	1071[a]
2004	I*	1999	1679	84%	1900	1615	85%	1428[a]

*Category I with vertical vent, category III with horizontal venting and no extractor.
†Category IV requires sealed vent with condensate drain. Category I uses conventional B vent.
[a]Boilers only.
Note: Ratings are for natural or propane gas and for elevations up to 5,000 ft. above sea level. For higher elevations, consult the factory.

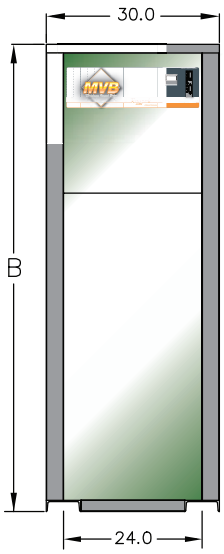
PHYSICAL DATA

Models		Dimensions (inches)														Operating Weight (lbs.)	Amps‡
MVB Cat. I*	MVB Cat. IV	B Ht.	D	E	F	G† NPT	H NPT	K-Ø Cat. I*	K-Ø Cat. IV	M Cat I*	M Cat IV	N CA Ø	P	R	V		
504	503	43	32	35	23-3/4	1	2	8	6	14-1/8	14-1/2	6	35	6	2	600	12
754	753	49	38	41	29-3/4	1	2	10	6	16	14-1/2	6	41	6	2	660	12
1104	1003	55	44	47	35-3/4	1-1/4	2-1/2	10	6	16	14-1/2	6	47	6	2	720	12
1504	1253	61	50	53	41-3/4	1-1/4	2-1/2	12	8	18-1/8	17-3/4	8	53	6	2	780	12
	1503	67	56	59	47-3/4	1-1/4	2-1/2		8		17-3/4	8	59	6	2	840	12
2004	1753	75	62	65	53-3/4	2	2-1/2	14	8	20-1/8	17-3/4	8	68	9	5	940	18
	2003	81	68	71	59-3/4	2	2-1/2		8		17-3/4	8	74	9	5	1000	18

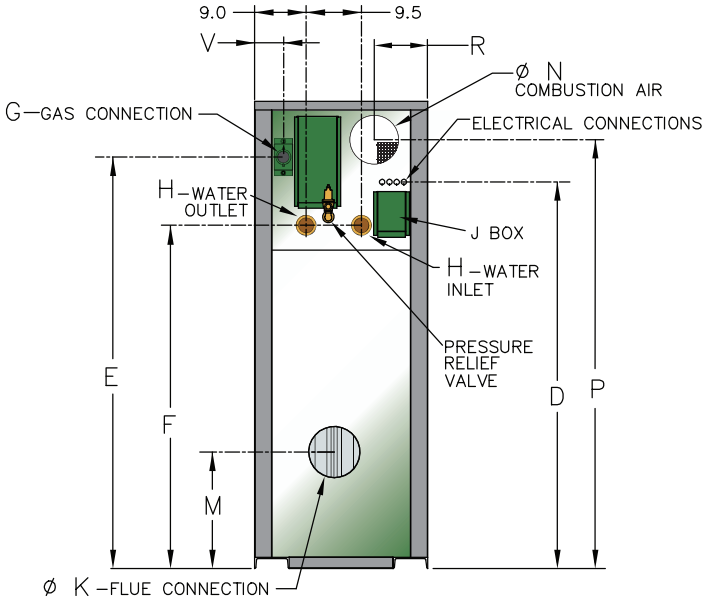
*Category I with vertical vent, category III with horizontal venting and no extractor.
†NPT is for Natural Gas. For Propane, NPT= 1" for all water heater/boiler sizes.
‡Current draw is for heater only. (Supply breaker must have a delayed trip.)



TOP VIEW



FRONT VIEW



FRONT VIEW

All components are contained inside the cabinet *(except PRV)*, no external fans or valves to deal with.

	Heater Side		From Combustible Surfaces (min.)	For Service (recommended)
CLEARANCES	Floor*		0″	0″
	Rear		12″	24″
	Right Side		1″	1″
	Left Side		1″	1″
	Top	Indoor	0″	10″
		Outdoor	Unobstructed	Unobstructed
	Front		Open	24″
	Vent Stack	Indoor	1″	1″
	Vent Cap	Outdoor	12″	12″

*Do not install on carpeting
Note: Local codes may require increased clearances

	MVB Model	Water Hardness					
		Soft		Medium		Hard	
		HP	Amps	HP	Amps	HP	Amps
PUMP	503/504	1/4	6	1/4	6	3/4	11
	753/754	1/4	6	1/2	7	3/4	11
	1003/1104	1/4	6	1/2	7	1	14
	1253	1/2	7	1	14	1	14
	1503/1504	3/4	11	1	14	1	14
	1753	1	14	1-1/2	15	1-1/2	15
	2003/2004	1	14	1-1/2	15	1-1/2	15

Note: Current draw (Amps) is for pump only
*Pump selections based on ?/75 equivalent length of tubing

Water hardness grains per gallon
Soft = 0-4 • Medium = 5-15 • Hard = 16-25

Raypak
ISO 9001
Registered Quality Management System

On-Board Diagnostic Center

Raypak's MVB comes equipped with a microprocessor-controlled diagnostic control center that displays its information on a 2x20 character LCD display in plain English. This control monitors system safeties, ignition faults and system status, while storing up to 16 reported faults. Raypaks diagnostic center monitors the fault outputs of the Fenwal ignition control. Converting the Fenwal's flashing lights into real English fault codes that anyone can understand. The control is also equipped with a SPDT dry contact relay output that is switched anytime a safety fault occurs. This can be used for a heater alarm or a BMS safety interface.

Diagnostic Information

Safety Faults

- Condensate Drain
- Manual High Limit
- Auto High Limit
- Low Water Cut-off
- Vent Pressure
- High Gas Pressure
- Low Gas Pressure
- Controller Alarm
- Flow Switch
- Blower Switch
- Factory Option
- External Interlock
- Cold Water Run

Ignition Control Faults

- Low Air
- Flame- No CFH
- Ignition Lockout
- Low HSI Current
- Low 24VAC
- Internal Control Fault

CATEGORY I* BOILERS (TYPE H)

MVB Model	Flow Rates						Pressure Drops					
	Minimum Flow			Maximum Flow			20°F		30°F		40°F	
	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	GPM	ΔP FT	GPM	ΔP FT
504	25	1.1	34	100	11.3	8	42	2.7	28	1.4	N/A	N/A
754	32	1.7	40	100	13.8	13	63	6.0	42	2.9	32	1.7
1104	46	4.1	40	113	18.6	16	92	13.3	62	6.7	46	4.1
1504	63	8.0	40	113	22.2	22	N/A	N/A	84	13.3	63	8.0
2004	84	16.0	40	113	27.2	30	N/A	N/A	112	26.9	84	16.0

CATEGORY I* WATER HEATERS (TYPE WH)

MVB Model	Flow Rates						Pressure Drops			
	Minimum Flow			Maximum Flow			20°F		30°F	
	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	GPM	ΔP FT
504	50	2.8	17	100	11.3	8	N/A	N/A	28	1.4
754	50	3.5	25	100	13.8	13	64	6.1	42	3.0
1104	60	6.3	30	113	18.6	16	90	12.6	60	6.3
1504	82	12.6	30	113	22.2	22	N/A	N/A	82	12.6
2004	109	25.5	30	113	27.2	29	N/A	N/A	109	25.5

CATEGORY IV BOILERS & WATER HEATERS (TYPE H & WH)

MVB Model	Flow Rates						Pressure Drops					
	Minimum Flow			Maximum Flow			20°F		30°F		40°F	
	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	GPM	ΔP FT	GPM	ΔP FT
503	25†	1.1	35	100	11.3	9	43	2.8	29	1.4	N/A	N/A
753	33†	1.9	40	100	13.8	13	65	6.4	43	3.1	33	1.9
1003	43‡	3.7	40	113	18.6	15	87	12.0	58	6.0	43	3.7
1253	54‡	6.2	40	113	22.2	19	109	20.9	73	10.2	54	6.2
1503	65‡	9.5	40	113	25.5	23	N/A	N/A	87	16.0	65	9.5
1753	76‡	13.4	40	113	27.2	27	N/A	N/A	101	22.5	76	13.4
2003	87‡	15.2	40	116	30.2	30	N/A	N/A	116	31.9	87	18.9

Boiler Only

*Category I with vertical vent, category III with horizontal venting and no extractor.
† Minimum flow 50GPM for WH hot water supply.
‡ Use 30° column as minimum flow for hot water supply.

TempTracker Mod

Raypak's MVB comes standard with TempTracker Mod. This control can be used for space heating and hot water supply with eight application-specific modes to meet various applications, including outdoor reset for heating systems. The control monitors and displays inlet and outlet temperatures on all applications as well as monitor outdoor temperature when an outdoor reset mode is selected. Only Raypak's TempTracker Mod allows for a user definable outdoor reset slope. Boiler adjustable limits prevent over cycling, saving energy and extending the life of the boiler. Your MVB is never down with a sensor failure thanks to Raypak's exclusive TempTracker software. It can operate with as little as one functioning sensor, keeping you up and running until service arrives.

- P or PID logic
- 4-20ma output
- Building management direct control
- 0-10VDC Setpoint/Direct Drive Input
- LCD Display

Cat. I*

84%

MVB Input	Recovery Rates (GPH)														
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
500	5,091	2,545	1,697	1,273	1,018	848	727	636	566	509	463	424	392	364	339
750	7,636	3,818	2,545	1,909	1,527	1,273	1,091	955	848	764	694	636	587	545	509
1100	11,200	5,600	3,733	2,800	2,240	1,867	1,600	1,400	1,244	1,120	1,018	933	862	800	747
1500	15,273	7,636	5,091	3,818	3,055	2,545	2,182	1,909	1,697	1,527	1,388	1,273	1,175	1,091	1018
1999	20,353	10,177	6,784	5,088	4,071	3,392	2,908	2,544	2,261	2,035	1,850	1,850	1,566	1,454	1,357

Cat. I*

84%

MVB Input	Recovery Rates (GPH)														
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
500	5,091	2,545	1,697	1,273	1,018	848	727	636	566	509	463	424	392	364	339
750	7,636	3,818	2,545	1,909	1,527	1,273	1,091	955	848	764	694	636	587	545	509
1045	10,640	5,320	3,547	2,660	2,128	1,773	1,520	1,330	1,182	1,064	967	887	818	760	709
1425	14,682	7,341	4,894	3,670	2,936	2,447	2,097	1,835	1,631	1,468	1,335	1,223	1,129	1,049	979
1900	19,576	9,788	6,525	4,894	3,915	3,263	2,797	2,447	2,175	1,958	1,780	1,631	1,506	1,398	1,305

Cat. IV

87%

MVB Input	Recovery Rates (GPH)														
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
500	5,273	2,636	1,758	1,318	1,055	879	753	659	586	527	479	439	406	377	352
750	7,909	3,955	2,636	1,977	1,582	1,318	1,130	989	879	791	719	659	608	565	527
999	10,535	5,267	3,512	2,634	2,107	1,756	1,505	1,317	1,171	1,053	958	878	810	752	702
1250	13,182	6,591	4,394	3,295	2,636	2,197	1,883	1,648	1,465	1,318	1,198	1,098	1,014	942	879
1500	15,818	7,909	5,273	3,955	3,164	2,636	2,260	1,977	1,758	1,582	1,438	1,318	1,217	1,130	1,055
1750	18,455	9,227	6,152	4,614	3,691	3,076	2,636	2,307	2,051	1,845	1,678	1,538	1,420	1,318	1,230
1999	21,080	10,540	7,027	5,270	4,216	3,513	3,011	2,635	2,342	2,108	1,916	1,757	1,622	1,506	1,405

Raypak A Rheem Company

MVB

		Water Heaters (Type WH)	Boilers (Type H)
HEAT EXCHANGER			
ASME, National Board Registered, 160 PSI	• HLW Stamp	●	N/A
	• H Stamp	N/A	●
Heat Exchanger Tubes	• Copper	●	●
	• Cupro Nickel	○	○
Bronze Headers		●	○
Cast Iron Headers		N/A	●
Pressure Relief Valve	• 60 PSI	○	●
	• 125 PSI	●	○
	• 30, 45, 75, 150 PSI	○	○
Temperature & Pressure Gauge		●	●
Pump	• 120V, Single-Phase	○	○
JACKET			
Indoor/Outdoor Certified		●	●
Vent Terminal	• Outdoor	○	○
	• Through-The-Wall	○	○
Fully-Enclosed Controls		●	●
Combustible Floor Rated		●	●
OPERATING CONTROLS			
120V Power Supply With 120V/24V Transformer		●	●
On/Off Switch		●	●
Programmable Pump Time Delay, Single-Phase	• Included In TempTracker Mod Controller	●	●
Terminal Block Connections	• Enable / Disable	●	●
	• External Interlocks	●	●
	• 0-10 VDC Setpoint/Direct Drive Input	●	●
Diagnostic LCD Display With Up To 16 Faults		●	●
Status Display Lights (4)		●	●
Temperature Controller With 3 Water Sensors	• TempTracker Mod (Up To 4:1 Turndown, Cat. IV)	●	●
	• Outdoor Reset Sensor	N/A	○
Multiple Boiler Controller	• TempTracker Mod+ Hybrid BACnet, Up To 16 boilers	○	○
	• Multi-Mod Platinum (BACnet)	○	○
SAFETIES			
Hot Surface Ignition System	• 1-Try (Standard On Cat. IV)	○	○
	• 3-Try (Standard On Cat. I)	●	●
High/Low Gas Pressure Switches		○	○
Blocked Vent And Air Pressure Switches		●	●
High Limit Switch	• Manual Reset, Fixed	●	●
	• Manual Reset, Adjustable	○	○
	• Automatic Reset, Adjustable	○	○
Low Water Cut-Off, 24V	• With Manual Reset And Test Buttons	○	○
Flow Switch		●	●
GAS TRAIN			
Modulating Combination Gas Valve		●	●
Combustion Air Blower		●	●
TruSeal Direct-Vent Ready		●	●
Additional Safety Valve	• Motorized (Externally Mounted)	○	○
	• Solenoid (Externally Mounted)	○	○
OTHER			
CSA-Certified Efficiency	• Cat. IV - 87% At Full Fire	●	●
	• Cat. I - 84% to 85% (See MBTUH Table)	●	●
Air Filter (Shipped Loose)		●	●
Alarm System		○	○
CSD-1 / GE GAP Control System		○	○
Low NOx	• Meets All Current Requirements	●	●
Cold Water Start	• Prevents Internal Condensation On Start-Up	○	○
Cold Water Run	• Prevents Condensation In Continuous Low-Temp Operation	○	○

● ● = Standard ○ ○ = Optional

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